

APPENDIX A - DEFINITIONS

Alternate Joint Typhoon Warning Center (AJTWC): Naval Pacific Meteorology and Oceanography Center, Yokosuka, Japan.

Center: The axis or pivot of a tropical cyclone usually determined by wind, temperature or pressure distribution.

Center Fix: Location of the center of a tropical cyclone by means other than reconnaissance aircraft penetration (e.g., AIREPS, aircraft/ship/land-based radar, or weather satellite). See Vortex Fix, below.

Central Pacific Hurricane Center (CPHC): The NWS Forecast Office responsible for issuing tropical cyclone warnings north of the equator between 180 degrees and 140 degrees west. CPHC is located at the Honolulu National Weather Service Forecast Office.

Checksum: Least significant digit of the numerical sum in a sequence of digits. Used in fix data and tropical cyclone warning messages wherever latitude, longitude, and time are given.

Cyclone: A closed atmospheric circulation rotating about an area of low pressure (counterclockwise in the Northern Hemisphere).

Extrapolated Warning Position: A forecast warning position derived from the previous warning position when no reliable fix information has been received since last warning.

Extratropical: Used in warnings and tropical summaries to indicate a cyclone has lost "tropical" characteristics. (NOTE: Draw no inference concerning the intensity or areal extent of a cyclone from this change to extratropical status, as a cyclone may become extratropical without losing winds of typhoon or storm intensity.) Commands concerned must not relax vigilance when a tropical cyclone is reclassified as extratropical. Warning activities will issue subsequent warnings as required.

Eye: Central area of a tropical cyclone when more than half is surrounded by a wall cloud.

Gusts: Rapid fluctuations in wind speed with a variation of 10 knots (5m/s) or more between peaks and lulls.

Hurricane: See "Typhoon/Hurricane", below.

Intensity: Maximum sustained surface wind speed, typically within one degree of the center of a tropical cyclone. U.S. warnings base sustained winds on a 1-minute average of the wind speed, while the warnings of many other nations base sustained winds on a 10-minute average. This use of a different time base results in sustained winds on foreign warnings being 12 percent lower than those of U.S. warnings

Joint Typhoon Warning Center (JTWC): A joint USN/USAF organization under the command of Commanding Officer, Naval Pacific Meteorology and Oceanography Center Pearl Harbor, Hawaii and the directorship of the Detachment 1, PACAF Air Operations Squadron (DET 1, PACAF AOS) Commander. CINCPACFLT established it on 1 May 1959 by direction of USCINCPAC. JTWC issues tropical cyclone warnings for the USPACOM area west of 180 degrees to the east coast of Africa.

Maximum Sustained Wind: Highest surface wind speed of a cyclone averaged over a 1-minute period of time. (NOTE: Wind is subject to gusts which bring a sudden, temporary increase in speed, e.g. MAXIMUM SUSTAINED WIND speeds of 30 knots may have superimposed gusts of 40 knots.) (See "INTENSITY").

Monsoon Depression: A tropical cyclonic vortex characterized by:

- a. Its large size, the outer-most closed isobar may have a diameter on the order of 600NM (1000 km).
- b. A loosely organized cluster of deep convective elements.
- c. A low-level wind distribution which features a light-wind core which may be partially surrounded by a band of gales.
- d. A lack of a distinct cloud system center. Note, most monsoon depressions in the western North Pacific eventually acquire persistent central convection and accelerated core winds leading to its transition into a convective tropical cyclone.

Monsoon Gyre: A mode of the summer monsoon circulation of the western North Pacific characterized by:

- a. A very large, nearly circular low-level cyclonic vortex that has an outer-most closed isobar with diameter on the order of 1200 nm (2500 km).
- b. A cloud band rimming the southern through eastern periphery of the vortex/surface low.
- c. A relatively long (two-week) life span - initially, a subsident regime exists in its core and western and northwestern quadrants with light winds and scattered low cumulus clouds; later, the area within the outer closed isobar may fill with deep convective clouds and become a monsoon depression or tropical cyclone.
- d. The large vortex cannot be the result of the expanding wind field of a preexisting monsoon depression or tropical cyclone. Note, a series of small or very small tropical cyclones may emerge from the "head" or leading edge of the peripheral cloud band of a monsoon gyre (Lander, 1993).

Monsoon Trough: A low latitude low-pressure region occurring near large continental areas due to land-sea monsoonal effects. A directional shear zone with westerlies on the equatorial side and easterlies on the polar side characterize the trough.

Movement Past 6 Hours: Estimated movement of a tropical cyclone at warning-time. It is based on apparent motion of the cyclone between warning time and six hours prior. This estimate does not reflect short-term, small-scale oscillations of the cyclone center.

National Hurricane Center (NHC): NWS Forecast Office responsible for issuing tropical cyclone warnings in the Pacific area of the Northern Hemisphere east of 140 degrees west. NHC is located in Miami, FL.

National Hurricane Operations Plan (NHOP): A Working Group for Hurricane and Winter Storm Operations of the Office of the Federal Coordinator for Meteorological Services and Supporting Research publishes the NHOP annually in coordination with the Departments of Defense, Transportation,

and Commerce. The NHOP serves the same purpose as the USCINCPACINST 3140.1 (series) for the Atlantic and North Pacific Ocean east of 180 degrees. Whenever possible, details of this instruction coincide with those of the NHOP.

Prognostic Reasoning Message: This message with the internal caveat "FOR METEOROLOGISTS" contains a technical discussion of current synoptic conditions and reasoning for the forecast track, intensity, and wind distribution in the most recent tropical cyclone warning.

Quadrant: The 90 degrees sector of the cyclone centered on the designated direction of an eight-point compass. (For example: "East Quadrant" refers to the sector of the cyclone from 045 degrees through 090 degrees to 135 degrees.)

Relocated: Term used in a warning to indicate a vector drawn from the preceding to current position is not necessarily a reasonable representation of cyclone movement.

Semicircle: The 180 degrees sector of a cyclone centered on a direction designated from an eight-point compass. (EXAMPLE: "South Semi-circle" refers to the segment of a cyclone from 090 degrees through 180 degrees to 270 degrees.)

Significant Tropical Cyclone: A tropical cyclone becomes "significant" with issuance of the first numbered warning by the responsible warning agency.

Significant Tropical Weather Advisory: A daily message describing significant tropical activity and JTWC's evaluation of the potential for development into a significant tropical cyclone.

Size: A real extent of the tropical cyclone, usually measured radially outward from the center to outer-most closed isobar.

Storm Surge: A sudden abnormal rise in the level of the sea associated with a tropical cyclone. This wind-induced increase in wave height can be especially dangerous when it arrives coincident with local high tide.

Storm Tide: Actual level of sea water resulting from the astronomic tide combined with the storm surge.

Strength: Average speed of surrounding low-level wind flow, usually measured within one to three degrees of the center of a tropical cyclone.

Super Typhoon/Hurricane: Warm core tropical cyclone in which the maximum sustained surface wind (1-minute mean) is 130 knots or greater.

Suspect Area: Area suspected of containing a developing or existing tropical cyclone. Suspect areas are listed in the ABIO and ABPW.

Tropical Cyclone: General term for a non-frontal low-pressure system, developing over tropical or subtropical waters, and having a definite organized circulation.

Tropical Cyclone Formation Alert: Message advising of an area with the potential for development into a significant tropical cyclone.

Tropical Cyclone Warning: Message issued by responsible forecast activities that provide tropical cyclone location, intensity, size, and movement.

Tropical Depression: Tropical cyclone that may have one or more closed isobars and maximum sustained surface winds (1-minute mean) of 33 knots or less.

Tropical Disturbance: Discrete system of apparently organized convection, generally 100 to 300 miles in diameter, that originates in the tropics or sub-tropics, and has a non-frontal migratory character and maintains its identity for 24 hours or more. A weak surface circulation may exist. If so, it may or may not be associated with a detectable perturbation of the upper-air wind field. It is the basic generic designation, which, in successive stages of intensification, becomes a tropical depression, tropical storm, or typhoon (hurricane).

Tropical Storm: A warm core tropical cyclone with maximum sustained surface winds (1-minute mean) in the range of 34 to 63 knots inclusive.

Typhoon/Hurricane: A warm core tropical cyclone in which maximum sustained surface wind (1-minute mean) ranges from 64 to 129 knots. Called a typhoon if west of 180 degrees longitude and a hurricane if east of 180 degrees. Foreign governments use these or other terms for tropical cyclones and may apply different intensity criteria.

USCINCPACINST 3140.1 (series): U.S. Pacific Command Tropical Cyclone Operations Manual.

Wall Cloud: An organized band of cumuliform clouds immediately surrounding the central area of low pressure of a tropical cyclone. Wall clouds may entirely enclose the eye or only partially surround it.

Westerly Wind Burst (WWB): A short-duration low-level westerly wind event which occurs along and near the equator in the western Pacific Ocean and sometimes in the Indian Ocean. Typically lasts several days and has westerly winds of at least 10 knots. Intense WWB's are associated with a large cluster of deep-convective clouds along the equator and is a necessary precursor to the formation of tropical cyclone twins symmetrical with respect to the equator.

APPENDIX B - TROPICAL CYCLONE NAMES

Names for tropical cyclones in the North West Pacific Ocean and South China Sea (Effective until 31 December 1999)

NOTE: Tropical cyclone names will be assigned by JTWC in rotation, alphabetically, starting with (Ann) for the first tropical cyclone of 1996. When the last name in Column 4 (Zia) has been used, the sequence will begin again with the first name in Column 1 (Ann).

This name rotation will occur through 31 December 1999.

Ann	Abel	Amber	Alex
Bart	Beth	Bing	Babs
Cam	Carlo	Cass	Chip
Dan	Dale	David	Dawn
Eve	Ernie	Ella	Elvis
Frankie	Fern	Fritz	Faith
Gloria	Greg	Ginger	Gil
Herb	Hannah	Hank	Hilda
Ian	Isa	Ivan	Iris
Joy	Jimmy	Joan	Jacob
Kirk	Kelly	Keith	Kate
Lisa	Levi	Linda	Leo
Marty	Marie	Mort	Maggie
Niki	Nestor	Nichole	Neil
Orson	Opal	Otto	Olga
Piper	Peter	Penny	Paul
Rick	Rosie	Rex	Rachel
Sally	Scott	Stella	Sam
Tom	Tina	Todd	Tanya
Violet	Victor	Vicki	Virgil
Willie	Winnie	Waldo	Wendy
Yates	Yule	Yanni	York
Zane	Zita	Zeb	Zia

NOTE: Effective 1 January, 2000, JTWC will no longer name tropical cyclones in the North West Pacific. The U.S. Department of Defense tropical cyclone designation will be a tropical cyclone number and basic designator (e.g. Typhoon 01W). After the Regional Specialized Meteorological Center, (RSMC) in Tokyo, Japan, has named a tropical cyclone, JTWC will include the name in parenthesis following the tropical cyclone number and basin designator (e.g. Typhoon 01W (Damrey). RSMC Tokyo is the World

Meteorological Organization sanctioned warning agency responsible for the North Western Pacific Ocean including the South China Sea.

Names for Western North Pacific Ocean and South China Sea Tropical cyclones (Effective 1 January, 2000)

Contributed by	I Name	II Name	III Name	IV Name	V Name
Cambodia	Damrey	Kong-Rey	Nakri	Krovanh	Sarika
China	Longwang	Yutu	Fengshen	Dujuan	Haima
Dpr Korea	Kirogi	Toraji	Kalmaegi	Maemi	Meari
Hk, China	Kai-Tak	Man-Yi	Fung-Wong	Choi-Wan	Ma-On
Japan	Tembin	Usagi	Kammuri	Koppu	Tokage
Lao Pdr	Bolaven	Pabuk	Phanfone	Ketsana	Nock-Ten
Macau	Chanchu	Wutip	Vongfong	Parma	Muifa
Malaysia	Jelawat	Sepat	Rusa	Melor	Merbok
Micronesia	Ewiniar	Fitow	Sinlaku	Nepartak	Nanmadol
Philippines	Bilis	Danas	Hagupit	Lupit	Talas
Ro Korea	Kaemi	Nari	Changmi	Sudal	Noru
Thailand	Prapiroon	Vipa	Megkhla	Nida	Kularb
U.S.A.	Maria	Francisco	Higos	Omais	Roke
Viet Nam	Saomai	Lekima	Bavi	Conson	Sonca
Cambodia	Bopha	Krosa	Maysak	Chanthu	Nesat
China	Wukong	Haiyan	Haishen	Dianmu	Haitang
Dpr Korea	Sonamu	Podul	Pongsona	Mindulle	Nalgae
Hk, China	Shanshan	Lingling	Yanyan	Tingting	Banyan
Japan	Yagi	Kajiki	Kujira	Kompasu	Washi
Lao Pdr	Xangsane	Faxai	Chan-Hom	Namtheun	Matsa
Macau	Bebinca	Vamei	Linfa	Malou	Sanvu
Malaysia	Rumbia	Tapah	Nangka	Meranti	Mawar
Micronesia	Soulik	Mitag	Soudelor	Rananim	Guchol
Philippines	Cimaron	Hagibis	Imbudo	Malakas	Talim
Ro Korea	Chebi	Noguri	Koni	Megi	Nabi
Thailand	Durian	Ramasoon	Hanuman	Chaba	Khanun
U.S.A.	Utor	Chataan	Etau	Kodo	Vicente
Viet Nam	Trami	Halong	Vamco	Songda	Saola

APPENDIX C - ACRONYMS

AB	Air Base
ABW	Air Base Wing
ABIO	Significant Tropical Weather Advisory for the Indian Ocean
ABPW	Significant Tropical Weather Advisory for the Western Pacific Ocean
ACCS	Air Control Center Squadron
ADEOS	Japanese Advanced Earth Observing Satellite
ADP	Automated Data Processing
AFB	Air Force Base
AFWA	Air Force Weather Agency
AIREP	Aircraft (Weather) Report
AJTWC	Alternate Joint Typhoon Warning Center, Yokosuka, Japan
AMOS	Automatic Meteorological Observing Station
AOR	Area of Responsibility
ARC	Automated Remote Collection (system)
ARGOS	International Service for Drifting Buoys
ARQ	Automated Response to Query
ATCF	Automated Tropical Cyclone Forecast (system)
ATCR	Annual Tropical Cyclone Report
AUTODIN	Automated Digital Network

AVHRR	Advanced Very High Resolution Radiometer
AWDS	Automated Weather Distribution System
AWN	Automated Weather Network
BLND	Blended (Hybrid Aid)
CDO	Central Dense Overcast
CI	Current Intensity
CIMSS	Cooperative Institute for Meteorological Satellite Studies
CINCPACFLT	Commander-in-Chief, Pacific Fleet
CIV	Civilian
CLD	Cloud
CLIM	Climatology
CLIP or CLIPER	Climatology and Persistence Technique
CM	Centimeter(s)
C-MAN	Coastal-Marine Automated Network
CMOD	Compact Meteorological and Oceanographic Drifter (buoy)
COMNAVMETOCCOM or CNMOC	Commander, Naval Meteorology and Oceanography Command
CPA	Closest Point of Approach
CPHC	Central Pacific Hurricane Center, Honolulu, HI
CSC	Cloud System Center
CSUM	Colorado State University Model
CW	Continuous Wave
DAVE	A Hybrid Aid
DD	Digital Dvorak

DDN	Defense Data Network
DEG	Degree(s)
DISN	Defense Information Systems Network
DMS	Defense Messaging System
DMSP	Defense Meteorological Satellite Program
DOD	Department of Defense
DSN	Defense Switched Network
DTG	Date Time Group
EGRR	Bracknell Model
ENSO	El Niño-Southern Oscillation
ERS	European Remote Sensing Satellite
FBAM	FNMOC Beta and Advection Model
FI	Forecast Intensity (Dvorak)
FLENUMETOCEN or FNMOC	Fleet Numerical Meteorology and Oceanography Center, Monterey, CA
FT	Foot/Feet
FTP	File Transfer Protocol
GFDN	Geophysical Fluid Dynamics-Navy Model
GMS	Japan Meteorological Agency Geostationary Meteorological Satellite
GMT	Greenwich Mean Time
GOES	Geostationary Operational Environmental Satellite
GSRS	Geostationary Satellite Receiving System
GTS	Global Telecommunications System
HIRS	High Resolution Infrared Sounder
hPa	Hectopascal

HPAC	Mean of XTRP and CLIM Techniques (Half Persistence and Climatology)
HF	High Frequency
HR	Hour(s)
ICAO	International Civil Aviation Organization
INIT	Initial
INST	Instruction
IP	Internet Protocol
IR	Infrared
JGSM	Japan Meteorological Agency Global Spectral Model
JTWC	Joint Typhoon Warning Center, Pearl Harbor, HI
JTWC92	Statistical-Dynamical or JT92 Objective Technique
JTYM	Japan Meteorological Agency Typhoon Model
KM	Kilometer(s)
KT	Knot(s)
LAN	Local Area Network
LAT	Latitude
LLCC	Low-Level Circulation Center
LONG	Longitude
LUT	Local User Terminal
LVL	Level
M	Meter(s)
MAX	Maximum
MB	Millibar(s)
MBAM	Medium Beta and Advection Model

MCAS	Marine Corps Air Station
MCS	Mesoscale Convective System
MET	Meteorological
METEOSAT	European Meteorological Satellite
MIN	Minimum
MINI-MET	Mini-Meteorological(buoy)
MM	Millimeter(s)
MOVG	Moving
MSLP	Minimum Sea-level Pressure
MSU	Microwave Sounding Unit
NARDAC	Naval Regional Data Automation Center
NAS	Naval Air Station
NASA	National Aeronautics and Space Administration
NAVPACMETOCEN	Naval Pacific Meteorology and Oceanography Center
NCEP	National Centers for Environmental Prediction
NESDIS	National Environmental Satellite, Data, and Information Service
NEXRAD	Next Generation (Doppler Weather) Radar (WSR-88D)
NHC	National Hurricane Center
NIPRNET	Non-secure Internet Protocol Router Network
NM	Nautical Mile(s)
NMC	National Meteorological Center
NOAA	National Oceanic and Atmospheric Administration
NOGAPS or NGPS	Navy Operational or NGPS Global Atmospheric Prediction System

NPS	Naval Postgraduate School
NR	Number
NRL or NRL-MRY	Naval Research Laboratory, Monterey, CA
NORAPS or NRPS	Navy Operational Regional Atmospheric Prediction System
NSCAT	NASA Scatterometer
NSDS-E	Naval Satellite Display System-Enhanced
NWP	Northwest Pacific
NWS	National Weather Service
OBS	Observations
OLS	Operational Linescan System
ONR	Office of Naval Research
OSS	Operations Support Squadron
OSB	Ocean Sciences Branch
OTCM	One-Way (Interactive) Tropical Cyclone Model
PACAF	Pacific Air Force
PACMEDS	Pacific Meteorological Data System
PACOM	Pacific Command
PC	Personal Computer
PCN	Position Code Number
PIREP	Pilot Weather Report(s)
QBO	Quasi-Biennial Oscillation
RADOB	Radar Observation
RECON	Reconnaissance
RECR	Recurve (Forecast Aid)

RMSE	Root mean square error
ROCI	Radius of outer-most closed isobar
SAT	Satellite
SCS	South China Sea
SEC	Second(s)
SFC	Surface
SIPRNET	Secret Internet Protocol Router Network
SLP	Sea-Level Pressure
SPAWARSSYSCOM	Space and Naval Warfare Systems Command, San Diego, CA
SSM/I	Special Sensor Microwave/Imager
SST	Sea Surface Temperature
ST	Subtropical
STNRY	Stationary
STR	Subtropical Ridge
STRT	Straight (Forecast Aid)
STY	Super Typhoon
SWDIS	Satellite Weather Data Imaging System
TAPT	Typhoon Acceleration Prediction Technique
TC	Tropical Cyclone
TCFA	Tropical Cyclone Formation Alert
TD	Tropical Depression
TDA	Typhoon Duty Assistant
TDO	Typhoon Duty Officer
TIF	Tagged Image File format

TIROS-N	Television Infrared Observational Satellite Next Generation
TOGA	Tropical Ocean Global Atmosphere
TOVS	TIROS Operational Vertical Sounder
TS	Tropical Storm
TUTT	Tropical Upper-Tropospheric Trough
TY	Typhoon
TYAN	Typhoon Analog (Forecast Aid)
ULCC	Upper-Level Circulation Center
USAF	United States Air Force
USCINCPAC	U.S. Commander in Chief, Pacific, Honolulu, HI
USN	United States Navy
VIS	Visual
WESTPAC	Western (North) Pacific
WGTD	Weighted (Hybrid Aid)
WMO	World Meteorological Organization
WNP	Western North Pacific
WRN or WRNG	Warning(s)
WSD	Wind Speed and Direction
WSR-88D	Weather Surveillance Radar 1988 Doppler
WVTW	Water Vapor Tracked Winds
WWB	Westerly Wind Burst
WWW	World Wide Web
XT	Extratropical
XTRP	Extrapolation

Z

Zulu time (Greenwich Mean Time/Universal Coordinated Time)

APPENDIX D - PAST ANNUAL TROPICAL CYCLONE REPORTS

Copies of the past Annual Tropical Cyclone Reports for DOD agencies or contractors can be obtained through:

Defense Technical Information Center (DTIC)
DTIC-BR (Reference & Retrieval Division)
8725 John J. Kingman Road
Suite 0940
Ft. Belvoir, VA 22060-6218
Phone: comm (703) 767-8274
DSN 427-9070
Fax: comm (703) 767-9070
DSN 427-9070

Copies for non-DOD agencies or users can be obtained from:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Phone: (703) 487-4650
Fax: (703) 321-8547

Refer to the following numbers when ordering:

Year	Acquisition Number	Year	Acquisition Number	Year	Acquisition Number
1959	AD 786147	1972	AD 768334	1985	AD A168284
1960	AD 786148	1973	AD 777093	1986	AD A184082
1961	AD 786149	1974	AD 010271	1987	AD A191883
1962	AD 786128	1975	AD A023601	1988	AD A207206
1963	AD 786208	1976	AD A038484	1989	AD A232469
1964	AD 786209	1977	AD A055512	1990	AD A239910

Year	Acquisition Number	Year	Acquisition Number	Year	Acquisition Number
1965	AD 786210	1978	AD A070904	1991	AD A25 1952
1966	AD 785891	1979	AD A082071	1992	AD A274464
1967	AD 785344	1980	AD A094668	1993	AD A285097
1968	AD 785251	1981	AD A112002	1994	AD A301618
1969	AD 785178	1982	AD A124860	1995	AD A321611
1970	AD 785252	1983	AD A137836	1996	AD A332916
1971	AD 768333	1984	AD A153395	1997	TBD
				1998	TBD